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STRUCTURAL ANALYSIS REGARDING THE CAPABILITY OF JAENSEN'S PRODUCT TO BE ROLLED WITHOUT DAMAGE

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George S. Levy
3980 Del Mar Meadows
San Diego CA 92130-2258

Dear Mr. Levy,

I have been retained by Sacks Industrial Corporation to provide my expert opinion on whether self-furring, welded wire lathing as disclosed in US Patent 5,540,023 by Jaenson can be rolled without damaging or destroying the product.

I will begin by summarizing my qualifications to provide an expert opinion on this matter. I have a Bachelor's, Master's and Doctoral degree in Structural Engineering, and I have been a faculty member in Structural Engineering at the University of British Columbia for the past 17 years. I have held the senior academic rank Professor of Structural Engineering for the past 7 years, and I am currently Structural Engineering Group Leader (senior faculty member responsible for discipline) in the Department of Civil Engineering at the University of British Columbia.

I have carefully examined samples of the product called Davis Best- Lath "D" Welded Wire Fabric Lath provided to me by engineers acting on behalf of Sacks Industrial Corp. I was advised that Davis Wire Corporation purchased the Jaenson Wire Company and now produces the product described in Jaenson USP 5,540,023.

I have conducted a rational analysis using the principles of structural engineering, and I have had one of my graduate students conduct an experimental study to confirm the findings of my rational analysis. Based on the results of all this work, it is my expert professional opinion that this product cannot be rolled without damaging the product so that it cannot be utilized for its intended function.

Rational Analysis

A sketch of the cross-section of the product is shown in Fig. 1 below. Of particular importance is the fact that the line wires labeled 50 in the figure are offset (in a different vertical plane) from the line wires labeled 56 and 62 in the figure.

In order for this product to be rolled about an axis perpendicular to these line wires, one of three things must happen: (1) the line wires that are on the inside of the roll must shorten and the line wires on the outside of the roll must elongate in order to maintain the offset between these wires, or (2) the cross wires must deform so that the offset between the line wires is reduced to zero, or (3) some combination of 1 and 2. A simple analysis of the axial stiffness of the line wires and the out-of-plane bending stiffness of the cross wires indicates that only the cross wires will deform significantly when the product is rolled.

The next important issue is whether the cross wires will remain in the elastic range when they deform so that there is no offset between line wires. The answer depends on the distance between line wires, the geometry of cross wires, the diameter of cross wires and the yield strength of the steel used to make the cross wire. From my inspection of the product, I conclude that the cross wires will not remain elastic when they deform the required amount to eliminate the offset between line wires. As a result of plastic deformation of the cross wires, the product will be permanently deformed.

The important question that remains is whether the permanent deformation of the cross wires deform will be sufficient to make the product unusable. As the yield strength of the cross wires are not known to me, physical tests on the product are required to determine the level of damage that will result from rolling the product. The results of such tests are presented next.

Rolling Tests on Product

To determine the level of damage that will occur when the product is rolled, tests were conducted on samples of the product. These tests were designed by me, and supervised at all stages by one of my graduate students from the University of British Columbia, Alireza Khavaran.

The three samples of the product were approximately 28 x 102 in. In order to make it easier to roll the product, the backing paper and asphalt paper were removed from the samples. Prior to rolling the product, the samples were laid flat and the furring was measured at 64 points of intersection between the cross wires and the line wires using a digital caliper. To simulate continuous rolling, the end of the product was stapled to 1 x 2 in. board that was fastened to the cylinder. The diameter of the cylinder was 20 in. After the product was rolled around the cylinder, it was unrolled and laid flat again. The furring was measured again at exactly the same 64 points.

The tables below summarize the measured furring in inches for the three samples, before and after rolling the product. All furring values that meet or exceed the minimum value of 0.25 in. specified in ASTM 933 and required building codes are shown highlighted in yellow in the tables. As can be seen, all measurements taken in all three samples before rolling the product meet or exceed 0.250 in. However, after the product is rolled, very few values (only about 5% of the values) meet the 0.250 in. minimum requirement. Specifically, 3 of 64 in Sample 1, 3 of 64 in Sample 2, and 4 of 64 in Sample 3 meet the 0.250 in. minimum. Thus the conclusion is that rolling the product causes sufficient

plastic deformation of the cross wires that the product no longer can be considered a self-furring wire lath.

Summary

Based on an inspection of samples of welded wire lathing as disclosed in US Patent 5,540,023 by Jaenson, a rational analysis of this product using the principles of structural engineering, and the results of an experimental study on this product, it is my expert professional opinion that this product cannot be rolled without damaging it to a point that it no longer meets its intended use.

A summary of the important points are:

- In order for the product to be rolled, the cross wires must deform so that the offset between the line wires is reduced to zero.
- The amount of deformation required in the cross wires in order to align the line wires causes significant plastic deformation of the cross wires. The plastic deformation does not recover when the product is unrolled.
- Tests conducted on the product indicate that the plastic deformation that occurs in the cross wires in order to align the line wires is so severe that only about 5% of the product continues to have a minimum required furring of 0.250 in. Thus when the product is rolled, it is damaged to a level that makes it no longer suitable for its intended use.
- The line wires must align (offset reduced to zero) independent of the diameter of the roll. That is, the product is also damaged when rolled into very large diameter rolls.

I trust the above provides you with the information that you require at this time. Do not hesitate to contact me if you require clarification of this information, or further information.

Sincerely,

Dr. Perry Adebar, P.Eng.

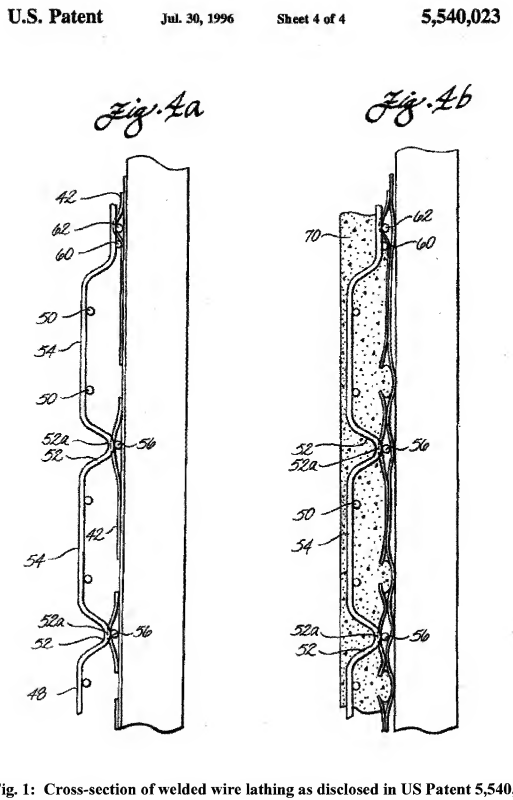

Fig. 1: Cross-section of welded wire lathing as disclosed in US Patent 5,540,023 by Jaenson.

Experimental Results:

Sample 1								
	6	***10***	***14***	***18***	***22***	***26***	***30***	***34***
Before rolling product								
C	0.279	0.271	0.255	0.267	0.275	0.255	0.252	0.252
D	0.292	0.299	0.272	0.299	0.297	0.278	0.284	0.258
F	0.265	0.345	0.279	0.305	0.297	0.315	0.305	0.289
G	0.258	0.310	0.310	0.279	0.256	0.310	0.291	0.263
I	0.253	0.298	0.275	0.254	0.264	0.312	0.271	0.258
J	0.298	0.349	0.289	0.288	0.284	0.285	0.321	0.307
L	0.299	0.286	0.274	0.276	0.305	0.314	0.269	0.253
M	0.276	0.294	0.294	0.266	0.252	0.273	0.283	0.252
After rolling product								
C	0.246	0.237	0.175	0.124	0.180	0.177	0.182	0.218
D	0.264	0.206	0.199	0.197	0.198	0.178	0.212	0.216
F	0.168	0.156	0.189	0.179	0.196	0.139	0.180	0.250
G	0.157	0.166	0.207	0.156	0.164	0.190	0.162	0.217
I	0.088	0.172	0.183	0.136	0.194	0.148	0.121	0.219
J	0.129	0.185	0.208	0.200	0.184	0.192	0.178	0.250
L	0.206	0.188	0.218	0.231	0.178	0.196	0.185	0.193
M	0.193	0.205	0.240	0.214	0.211	0.218	0.213	0.180

Sample 2								
	6	***10***	***14***	***18***	***22***	***26***	***30***	***34***
Before Rolling								
C	0.272	0.290	0.261	0.296	0.303	0.293	0.269	0.309
D	0.281	0.266	0.276	0.291	0.290	0.285	0.276	0.294
F	0.263	0.269	0.321	0.292	0.308	0.254	0.303	0.306
G	0.250	0.261	0.266	0.277	0.287	0.262	0.317	0.305
I	0.292	0.260	0.270	0.252	0.254	0.301	0.312	0.317
J	0.318	0.308	0.321	0.292	0.270	0.288	0.295	0.310
L	0.259	0.282	0.302	0.261	0.259	0.302	0.259	0.278
M	0.258	0.251	0.266	0.251	0.257	0.285	0.270	0.251
After Rolling								
C	0.234	0.105	0.195	0.175	0.169	0.175	0.185	0.246
D	0.213	0.152	0.206	0.197	0.185	0.204	0.190	0.252
F	0.145	0.173	0.216	0.167	0.192	0.175	0.189	0.237
G	0.158	0.173	0.174	0.164	0.210	0.189	0.216	0.226
I	0.151	0.251	0.187	0.129	0.169	0.169	0.189	0.234
J	0.185	0.272	0.247	0.183	0.219	0.127	0.168	0.238
L	0.135	0.266	0.224	0.150	0.199	0.205	0.171	0.176
M	0.122	0.249	0.227	0.141	0.223	0.179	0.225	0.202

Sample 3								
	6	***10***	***14***	***18***	***22***	***26***	***30***	***34***
Before Rolling								
C	0.266	0.261	0.289	0.286	0.281	0.305	0.306	0.284
D	0.300	0.282	0.295	0.318	0.308	0.325	0.321	0.285
F	0.317	0.285	0.259	0.321	0.328	0.280	0.318	0.304
G	0.275	0.287	0.258	0.292	0.309	0.250	0.288	0.261
I	0.293	0.295	0.274	0.297	0.262	0.289	0.291	0.295
J	0.292	0.317	0.313	0.325	0.307	0.319	0.326	0.316
L	0.283	0.296	0.292	0.309	0.262	0.269	0.285	0.276
M	0.296	0.286	0.287	0.285	0.257	0.250	0.282	0.267
After Rolling								
C	0.170	0.199	0.196	0.169	0.183	0.188	0.176	0.225
D	0.209	0.234	0.247	0.184	0.214	0.197	0.198	0.232
F	0.152	0.201	0.220	0.157	0.197	0.131	0.142	0.215
G	0.129	0.215	0.190	0.143	0.181	0.138	0.148	0.197
I	0.120	0.255	0.166	0.117	0.159	0.143	0.134	0.244
J	0.181	0.275	0.214	0.159	0.229	0.175	0.181	0.237
L	0.242	0.286	0.198	0.156	0.181	0.207	0.186	0.209
M	0.236	0.268	0.178	0.174	0.209	0.190	0.213	0.195